



Indicators of R&D, innovation in South African SOEs

State-owned entities can and should play a catalytic role in innovation in South Africa. Revitalising their contribution is an explicit policy outlook for the National System of Innovation, as reflected in the [2019 White Paper on Science, Technology and Innovation](#). The HSRC convened a policy dialogue in October 2022 to contribute research on new indicators for research, development and innovation by state-owned entities to inform this commitment. By **Gerard Ralphs** and **Nazeem Mustapha**

Recent public policy debate has been all but overwhelmed by the immediate impacts of large state-owned entities (SOEs), such as Eskom and Transnet, on South Africa's fiscal and economic performance.

Far less attention has been paid to their role in innovation, whether sectorally, nationally or globally.

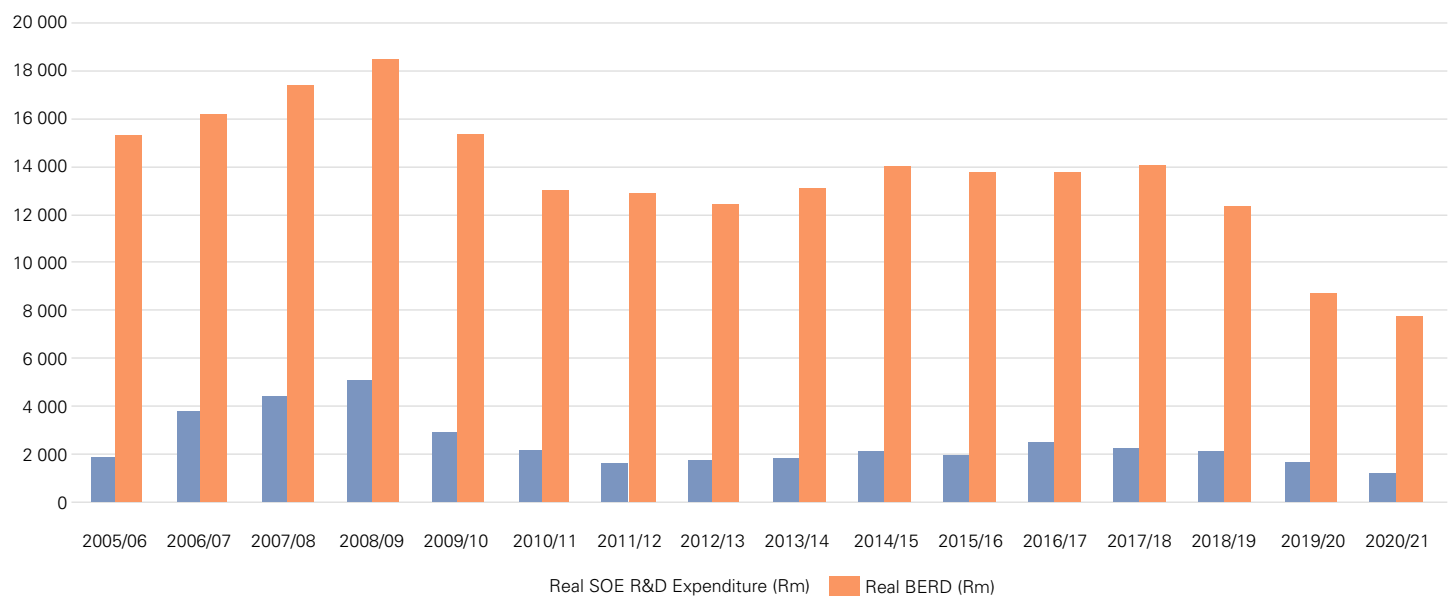
Policy initiatives such as the [2010 Presidential Review Committee on SOEs](#), the [2014 OECD stocktaking of SOE challenges and reforms in Southern Africa](#) and, most recently, the Zondo Commission, have served the purpose of a much-needed status check-in. New governance structures such as the [Presidential State-owned Enterprises Council](#) have placed improved SOE organisational performance squarely in the crosshairs at the highest level of decision-making.

Within this context, the [October 2022 dialogue](#) served to reinforce the value of systematically tracking research, development and innovation in SOEs. Such tracking, to the extent it informs broader SOE governance decision-making, has thus far been largely peripheral or missing within organisational monitoring and evaluation towards improved delivery of their mandates. This is an evidence gap the HSRC is working with partners across government to redress.



A Transnet coal train near Amantzimtoti in KwaZulu-Natal
 Photo: Bob Adams, [Wikimedia Commons](#)

Figure 1. R&D expenditure by SOEs has declined since the global financial crisis.



Source: R&D Survey/HSRC

A look back on key trends

Before the global financial crisis of 2008/2009, SOEs formed a fairly substantial component of R&D activity in South Africa’s business sector, contributing as much as 28% in 2008/09 to this sector’s expenditure on R&D.

Notwithstanding current challenges, applied R&D conducted at entities such as Eskom and allied energy SOEs such as the South African National Energy Development Institute (SANEDI), has served to reinforce the country’s capacity for generation of electricity reaching both industry, municipal users and household consumers, as well as to explore energy alternatives.

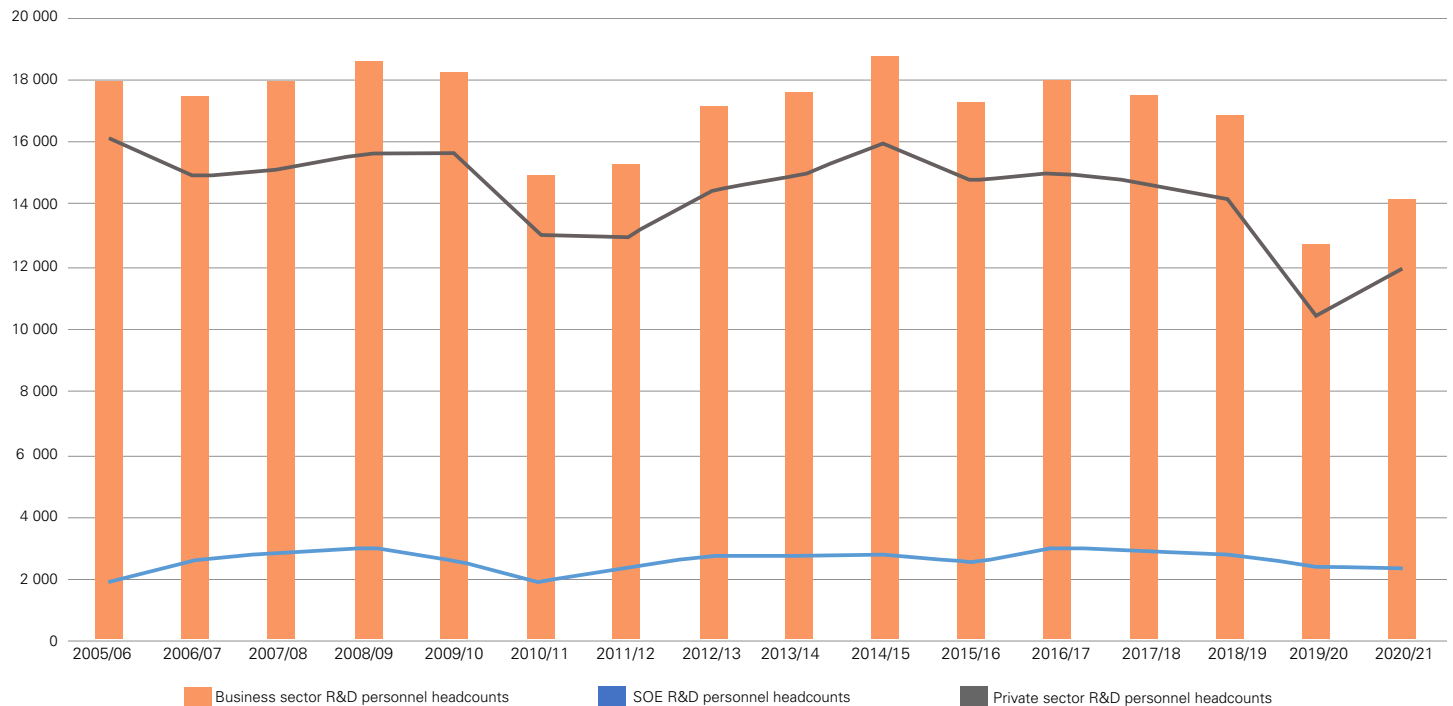
The same “taxpayer subsidisation of industry” argument may be attributed to other SOEs, for example, Transnet whose infrastructure advantage, where leveraged, has helped to reduce transport costs of goods and services.

Again, the role of R&D should not be discounted.

Particularly worrying, then, is that in real terms, SOEs’ expenditure on R&D in 2020/21 was the lowest since 2005/06. Reflecting on the trend R&D data presented by HSRC (Figures 1 and 2), Dr Mmboneni Muofhe, a senior official in the Department of Science and Innovation (DSI), expressed particular concern.

SOEs are economically important for various reasons, he explained. Historically, they have served as a training ground for many young professionals. Muofhe argued, however, that one of the characteristics that once helped them to thrive – close relationships between different players in this space – is now putting them at risk. So, when investment decreases for some – for example, an academic institution that SOEs have agreements with – it affects the entire ecosystem, he explained.

Figure 2. The number of R&D personnel employed by SOEs has remained static, despite increasing numbers of overall R&D personnel in South Africa.



Source: R&D Survey/HSRC

Research informing this dialogue

In 2016, the HSRC’s Centre for Science, Technology and Innovation Indicators (CeSTII) began working closely with the DSI on an analytical project to explore data on SOEs from the HSRC’s yearly R&D survey.

The centre followed this with in-depth research focusing on three SOEs: the SANEDI, Air Traffic and Navigation Services (ATNS), and South African Forestry Company SOC Limited.

An interrogation of the conditions that enable, support and facilitate R&D and innovation in SOEs (Table 2) informed a proposal for new indicators that SOEs and the government more broadly can use to track R&D and innovation (Table 1).

Speaking at the dialogue, HSRC director of strategic partnerships Dr Palesa Sekhejane said it was important to convene public policy dialogues to share this information.

Vital to understand SOE post-apartheid mandates

In his remarks to the panel, HSRC research director Dr Thokozani Simelane, who has worked on SOEs for several decades, discussed two distinct ways in which SOE mandates were expanded after the end of apartheid.

The first shift, he argued, was towards profit-making, while the second was driven by the state's articulation of a parallel responsibility to "answer to the many social needs and aspirations of the country". While laudable, putting these mandates into operation proved challenging in practice, Simelane said. "When South Africa opened up as a market, it found most SOEs not gearing."

The case study research performed by the HSRC adapted the management concept of gearing to shed light on the organisational features of SOEs considered key for R&D and innovation. These features included human and technological capabilities, networks, research infrastructure, and governance.

The HSRC team's working hypothesis was that if an SOE was gearing appropriately, then it would be in a position to leverage R&D and innovation to achieve its multiple mandates efficiently and effectively, and this would show up in the research findings. If it was not gearing appropriately, then a set of questions arise as to what investment or organisational change would be required to facilitate the development of R&D and innovation capabilities in the future.

Overcoming barriers

Reflecting on the HSRC case study results for ATNS, their senior manager for infrastructure research and management Nokuthula Phakathi said declining research funding, technology adoption and skills shortages in robotics and AI were among the barriers to advancing R&D and innovation.

Solving these challenges could help ATNS provide cheaper air travel.

Networks and leadership were key to driving R&D and innovation investments, Phakathi said. "We all know the environment is tricky and [there are] regulatory challenges. We need to be agile. We need to work towards goals [and] we need to allow our employees to be creative."

Policy options

In summative remarks at the dialogue, CeSTII executive head Dr Glenda Kruss said there "is no single policy option for government". She highlighted the systemic, organisational and institutional dimensions of innovation policy interventions (see box).

Dialogue takeaways from innovation policy specialist Dr Glenda Kruss

Systemic level

"We need to think in terms of platforms, enablers and funding streams; and start with R&D and innovation as strategic drivers."

"We must talk systems – the language of ecosystems, NSI and sectoral systems – linking to value chains, and putting competition front and centre."

Institutional level

"Systems are located within policy regulation frameworks and it is important to promote alignment across the work of different government departments."

"The dialogue discussion emphasised the need to pay attention to the layer of institutions, including leadership, agility and skills. We need to build institutional capabilities in SOEs."

"Indicators are needed at different levels for different purposes. Policy actors need systems indicators to see how the system is doing but SOEs themselves need RDI performance indicators and institutional indicators to strengthen organisational capabilities, which are difficult but vital to design."

Organisational level

"Most of the R&D is applied research, which puts it very close to the domain of innovation."

"One of the dimensions most picked up is collaboration [but] this is not an easy activity to incentivise. How do we incentivise collaboration?"

Table 1. Proposed indicators of R&D and innovation activities in SOEs

Dimensions measured	Significance	Indicators
R&D performance	The extent to which resources are dedicated to R&D	<ul style="list-style-type: none"> • R&D expenditure over time • R&D spend as a proportion of total firm budget • Type of R&D conducted (basic, applied, experimental)
Innovation performance	The extent to which resources are dedicated to innovation	<ul style="list-style-type: none"> • Innovation expenditure • Type of innovation • Business improvement due to innovation
IP	The extent to which knowledge is protected and commercialised	<ul style="list-style-type: none"> • Patents • Plant breeders' rights • Trademarks and Copyrights • Licences • Revenue generated from licensing



Table 2. Conditions that enable, support and facilitate R&D and innovation in SOEs

Dimensions measured	Significance	Indicators
Human capabilities	Human resources dedicated to R&D and innovation	<ul style="list-style-type: none"> • Human Resources dedicated to innovation • Human Resources dedicated to R&D • Type of HR • Qualifications • Training facilities
Technological capabilities	A history of capability within a particular technological domain is a potential area of strength for technological innovativeness	<ul style="list-style-type: none"> • Technologies in which the firm historically has proficiency
Research infrastructure	The maintenance and renewal of research infrastructure is a necessary element for current and future knowledge generation	<ul style="list-style-type: none"> • R&D expenditure on equipment etc • Research facilities and infrastructure • Co-operative agreements around infrastructure
Linkages, collaboration and networks	Linkages to support R&D and innovation	<ul style="list-style-type: none"> • Linkages with national, regional and global partners • Cooperation around training • Cooperation around research infrastructure • Cooperation around research • Co-operative agreements around training
Governance	Integration of R&D and innovation in business strategy	<ul style="list-style-type: none"> • Does the SOE have an R&D strategy? • Does the SOE have an innovation strategy? • Does the SOE have an IP and technology commercialisation strategy? • Is R&D included in the performance compact? • Is there a dedicated R&D structure within the SOE? • Is there a dedicated innovation structure within the SOE? • Is there a dedicated IP protection structure within the SOE? • Does the SOE have a legal framework within which it can commercialise products?

To download the reports, visit <https://hsrc.ac.za/press-releases/cestii/policy-dialogue-rdi-soes/>.

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Eskom's Medupi Power Station in construction
Photo: Wikimedia Commons